

## Gamma-ray spectroscopy method to measure Ra in matrices relevant to offshore oil and gas operations

S. A. Kreek, P. Torretto, F. Bazan, J. Bazan, H. L. Hall

Chemistry and Material Sciences Directorate, Lawrence Livermore National Laboratory,  
P. O. Box 808, L-231, Livermore, CA 94551

### Abstract:

We have developed a gamma-ray spectrometry method to reliably measure  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  in matrices relevant to offshore oil and gas production operations: biota, produced water (water with extremely high total dissolved solid content), sea sediment, and sea water. For the aqueous matrices, this method employs a fairly simple coprecipitation separation to isolate Ra from the bulk matrix. The  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  radioactivities are measured with a high-purity Ge detector via detection of the  $^{214}\text{Pb}/^{214}\text{Bi}$  and  $^{228}\text{Ac}$  daughter activities, respectively. This method is sensitive to both  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  at levels better than about 0.01 pCi/g. To achieve the best sensitivity for  $^{226}\text{Ra}$ , a 15 - 20 day ingrowth period is required for the  $^{226}\text{Ra}$  daughters to achieve equilibrium.

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